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KAOLIN FROM SULTAN-UVAISKOE DEPOSIT IN CERAMIC PRODUCTION

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It is demonstrated that the Sultan-Uvaiskoe deposit (Uzbekistan) is a promising source of high-quality kaolin for production of fine ceramics and refractories.

The Sultan-Uvaiskoe kaolin deposit is located in Karakalpakstan (Uzbekistan). The deposit has a favorable geological and economic location. Using kaolin from this deposit will make it possible to satisfy the demand of all industrial sectors producing ceramics articles in Karakalpakia and Khorezm.

The kaolin from the Sultan-Uvaiskoe deposit is represented by light gray and yellowish-white dense argillaceous rocks. The material composition of the kaolin was investigated at the Institute of Construction Materials of the Weimar University (Germany). According to the data of scanning electron microscope and chemical analysis, the initial nonconcentrated kaolin is a nonplastic (plasticity number 7.3 – 12.7) argillaceous rock containing nonrounded grains of quartz, muscovite, feldspar, flakes of mica, and a small quantity of halite NaCl. The kaolin varieties distinguished by their colors have the similar granulometric compositions. The rock-forming minerals are kaolinite (40 – 70%), quartz (25 – 50%), feldspar, muscovite, and sericite. The chemical composition of the kaolin in indicated in Table 1.

The results of the chemical analysis demonstrated that the kaolin from the Sultan-Uvaiskoe deposit by its content of Fe_2O_3 belongs to a higher grade than the kaolin from the currently mined Angrenskoe deposit. The ferric oxide content is on the average 0.51 – 1.10%; titanium dioxide usually does not exceed 0.51%, which satisfies the requirements imposed on high-grade kaolin from the Prosyanovskoe deposit. The aluminum oxide content after concentration ranges from 33.48 to 36.17%.

The whiteness of the kaolin fired at 1300°C is 83 – 87%, the heat resistance 1650 – 1670°C, the water absorption at
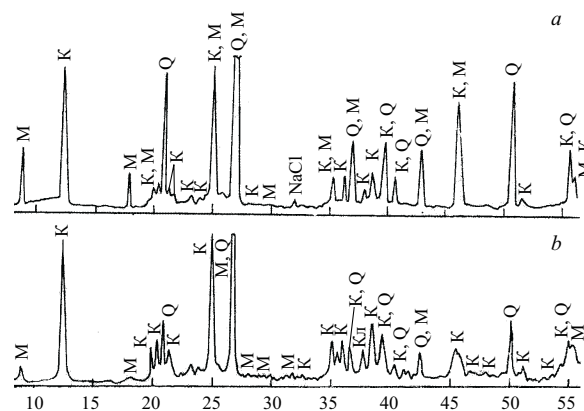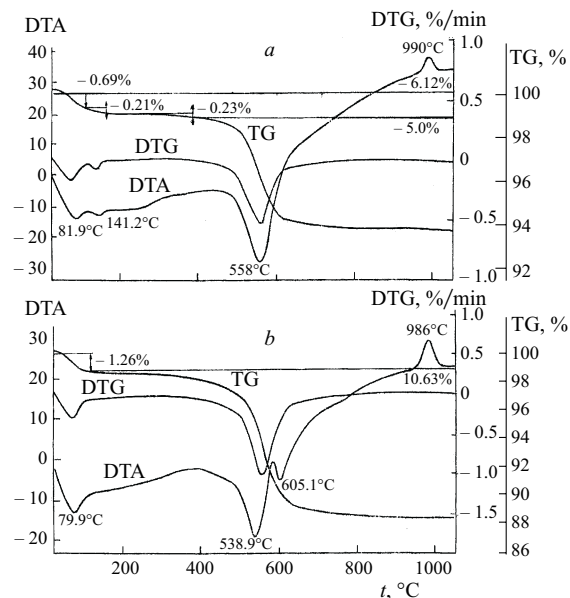

Fig. 1. X-ray patterns of nonconcentrated (*a*) and concentrated (*b*) kaolin: M) muscovite; K) kaolin; Q) quartz

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TABLE 1

Kaolin	Weight content, %								
	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	calcination loss
Nonconcentrated	71.58	16.80	1.00	0.51	1.50	0.32	0.72	0.91	6.70
Concentrated	54.70	33.48	0.56	0.47	0.51	0.30	1.42	0.93	7.63
	55.13	36.17	0.63	0.39	0.50	0.30	1.43	0.51	4.94

Fig. 2. Integrated thermogram of concentrated (*a*) and nonconcentrated (*b*) kaolin.

1400°C is 6.10 – 11.5%, and the sintering temperature over 1400°C.

Considering the chemical and mineralogical composition of the Sultan-Uvaiskoe kaolin, it is advisable to use noncon-

centrated kaolin in the production of construction ceramic materials, and concentrated kaolin in the production of fine ceramics (porcelain, faience).

The kaolin was investigated by the scanning electron microscope, x-ray, and thermographic analysis.

According to the x-ray analysis, the Sultan-Uvaiskoe kaolin mostly consists of kaolinite, quartz, muscovite, and a small quantity of halite. Halite is absent from the concentrated kaolin (Fig. 1). The thermogram (Fig. 2) clearly exhibits the phase transformations of kaolinite and the thermal effects typical of kaolin, i.e., the endothermic effects registered at 81.9, 141.2, and 558°C in concentrated kaolin and at 79.9, 538, and 605.1°C in nonconcentrated kaolin, and the exothermic effects observed at 990°C in concentrated and at 591 and 986°C in nonconcentrated kaolin.

The decrease in the weight and shrinkage caused by dehydration is usually related to endothermic effects. The fast shrinkage under heating above 1050°C and the corresponding exothermic effect are determined by the intense processes of formation of new crystalline phases, in particular, the mullite phase.

Thus, the Sultan-Uvaiskoe deposit should be regarded as a promising source of high-quality kaolin for the production of fine ceramics and refractory materials.